STRATEGY RESEARCH PROJECT

ENGINEERS IN COMPLEX CONTINGENCY OPERATIONS

BY

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ABSTRACT

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This Strategy Research Project addresses the relevance and challenges of executing engineer activities in support of U.S. Armed Forces participating in complex contingency operations.[1] The complex, uncertain environment, in which U.S. Forces operate, requires extensive engineer effort to enhance national interests and to fulfill all mission objectives. By focusing on engineer activities conducted during the Stabilization Force (SFOR) 6, Bosnia-Herzegovina, numerous lessons learned can highlight the challenges of executing successful engineer operations in a joint, multinational, coalition in the context of contemporary military operations. Relevant doctrine, addressing the common and unique aspects of complex contingency operations is still in need of refinement. These lessons requiring doctrinal refinement are evident in mine and unexploded ordnance removal, force mobility support, facility construction, force protection, and combined engineer projects. Moreover, combined engineer projects help to further engagement strategies with Multi-National Forces and former warring factions while expanding overall engineer capability. Engineer commanders must also deal with the full spectrum of military and civilian leadership challenges within a contingency area. To be effective, there must be an engineer command structure operating with proper doctrine and sufficient resources, to plan and execute the engineer operations so essential to the support of contemporary complex contingency operations.

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ENGINEERS IN COMPLEX CONTINGENCY OPERATIONS

"For the want of a truck load of gravel, we could bring peace to the world".
—Division Engineers, SFOR 6

This frequent quote heard among the engineers of Multinational Division-North (MND-N), Stabilization Forces 6 (SFOR 6), Bosnia, alludes to a truck load of gravel that can repair a washed out road. This road repair allows international organization and personal vehicles, loaded with home and business repair and construction materials, access to their villages and homes, facilitating the return of displaced persons, and resulting in overall economic growth of the community. During the transition period from continuing a "safe and secure environment" to "furthering economic stability," engineer forces are the most flexible and viable tools in the Commander's kit bag.

The SFOR Commander (COMSFOR), has intended to further Former Warring Faction (FWF), or the more positive term of Entity Armed Forces (EAF), commanders cooperation. He knows that a meeting between EAF leaders discussing common issues leads to cooperation, understanding, working together, and longer-term peace and stability. Military cooperation truly sets the example for civilian cooperation.

During a Joint Military Commission (JMC) meeting with EAF leaders at Sarajevo, the Serbian Army Commander and Bosnian Army Commander mentioned the poor status of a critical road that ran through both of their sectors. The COMSFOR, looking for a platform to further cooperation and coordination with the EAF leaders, asked Multinational Division-North (MND-N) for an update on the road. The Chief Engineer for MND-N had recently conducted a technical reconnaissance of the same route in support of task force mobility and was able to provide the requested information to confirm the appropriateness of the project.

Discussions between the MND-N JMC Chief and Chief Engineer determined that a "Joint Engineer Project" would be an excellent platform for maximizing and furthering engagement efforts between all military senior leaders (Croat, Bosniac and Serb), host nation civilian leaders (mayors, city engineers), non-governmental organizations (NGO) and private organizations (PVO), state department representatives (Brcko Ambassador, USAID), and multinational engineer units (U.S., Russians, Austrian, Hungarian, Canadian, Scandinavian, and the higher headquarters SFOR engineer cell).

The results of this engineer led engagement are increased cooperation between all military and civilian leaders, identification and development of host nation EAF military engineer construction capability, the completion of the first combined mission incorporating all three entity forces working together on the same project, multiple coverage of the joint project by TV and radio stations, improved route conditions, increased resettlement emphasis and capability along this tri-zonal border area, increased economic development of businesses along the road, professionalization of the EAF, and improved U.S.-Russian relations.

Figure 1. Joint Engineer Photo

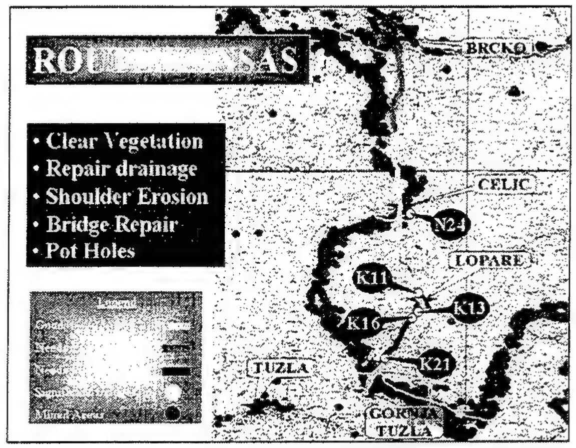


Figure 2. Entity-Coalition Project

As these examples illustrate, the key functions performed by military engineers often effect the success of peace / humanitarian operations by providing the enabling capabilities embedded in the appropriate mix, control, and resourcing of engineer assets. This paper will clarify some of the roles of engineers in peace operations and make specific recommendations for improving engineer effectiveness. This will be accomplished by analyzing engineer doctrine, addressing the importance and nature of engineer tasks assigned, and assessing the impact of combined engineer projects on confidence building between Entity Armed Forces.

DOCTRINE

Doctrine for peace operations is evolving. Acceptance of the changing, complex environment of today is slow; but increasing participation by Cold War based mechanized units in complex contingency operations such as the recent Balkans Contingency Operations, has increased the visibility and priority for developing Peace Operations doctrine and technology.

STRATEGIC – INTERAGENCY

To foster a durable peace or stability in these situations and to maximize the effect of judicious military deployments, the civilian components of an operation must be integrated closely with the military components.[2] While, military and civilian agencies should operate in a

synchronized manner through effective interagency management and the use of special mechanisms to coordinate agency efforts, they are not "in doctrine", nor are they likely to ever be.

JOINT

Joint doctrine for engineer support to Complex Contingency Operations is extremely limited. Since engineers frequently fall under the J4, Logistics on the Joint Staff, the engineer focus is primarily base civil engineer (base camps and ports) construction support. Joint Pub 4-04, "Joint Doctrine For Civil Engineering Support", is the primary joint engineer reference manual. There is no manual for joint operational or tactical engineer support.

OPERATIONAL

Field Manual 5-114, "Engineer Operations Short of War," provides excellent technical engineer procedures for force protection enhancements and gives a logistical deployment checklist. It does not, however, provide adequate guidance for coalition operations and other missions frequently encountered in complex contingency operations. The XVIII Airborne Corps Engineer developed and maintains an excellent "Smart Book" that defines the capabilities and limitations of the US engineer forces from all services, and also list some planning factors for the conduct of engineer operations in a contingency type environment.

TACTICAL

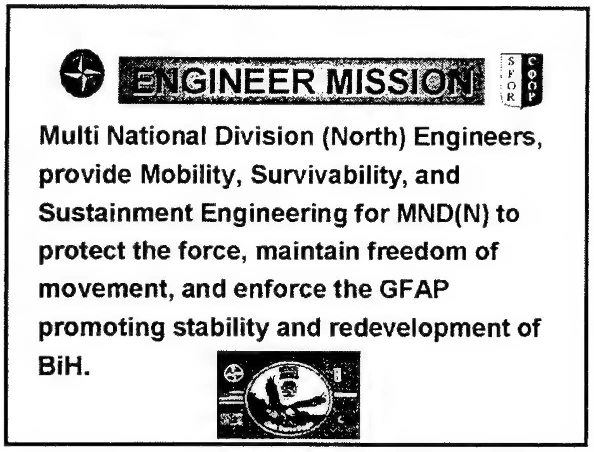
Tactical level doctrine for engineer contingency operations is driven by unit developed, contingency specific standard operating procedures (SOP). Units frequently tasked to support peace operations are writing their own SOP's and associated task, conditions, and standards based on the unique conditions and missions of the particular contingency they are involved in. Engineer operations in Bosnia are based on a unit Peace Support Operations SOP that is passed on and refined by each subsequent engineer unit rotating into country. Train-ups for engineer units and their staffs are conducted in accordance with Individual Training Tasks (ITT) and Mission Rehearsal Exercises (MRE) that are validated by the unit's chain of command and supported Corps Headquarters. Though these ITT and MRE tasks are documented, they are not "in doctrine." Until contingency operation unique tasks are incorporated into unit MTP's, frequently deploying units must identify and prioritize the 80% of their training on those MTP tasks that support their "go to war" mission, and allocate the remaining 20% or so of its training effort to specific contingency "unique" tasks.

ENGINEER MISSIONS IN COMPLEX CONTINGENCY OPERATIONS

Complex Contingency Operations require extensive military manpower for extended deployment periods. Engineer support for these various forces require multiple working, housing, sanitary, and recreation facilities. Due to the frequently austere or deteriorated conditions which contingency forces are required to operate, the quality of military facilities start out very austere. Then based on the capability of available military engineers, civilian contractors, construction materials, and funding, the U.S. Theater of Operations (TO) infrastructure is built. This infrastructure includes buildings (offices, barracks, maintenance, recreation), hard stands (tracked and wheeled, tactical and non-tactical vehicles, gravel, asphalt, concrete), airfields (fixed and rotary wing), port facilities, roads, and bridges. Facility standards and requirements for U.S. Air Force personnel and equipment are quite different than for the U.S. Army, which result in their own quality of life variation friction when co-located. Furthermore, mobility in war torn countries is frequently restricted by battlefield clutter from mines and unexploded ordnance and the destruction of bridge and road infrastructure.

US Engineer support for complex contingency operations comes from many sources. The US Army provides combat and construction engineer units, fire fighting engineers, civilian engineer project management organizations, and explosive ordnance disposal (EOD) technicians. The Air Force has Red Horse and Prime Beef Engineer units for airfield and base camp construction, and the Navy can provide Seabees for facilities construction, and EOD teams for unexploded ordnance (UXO) response and clearance. Specialty engineer units such as well drilling, asphalt paving, and prime power generation are available as the need and priority arises. Each of these units has service specific employment criteria and capabilities.

Coalition engineer capability is dependent on the country of origin. It is not good to assume that all non-U.S. engineers are organized, equipped and trained the same as for the US, even if the name is the same. Some coalition engineers only do construction, others demining, others UXO disposal, while others may do any combination of these functions. It is important to know the capabilities of specific national engineers, and employ them appropriately and safely when circumstances permit. In employment, restrictions include their ability or inability to work across coalition boundaries and provide or receive equipment or material support from or to other coalition engineer members.



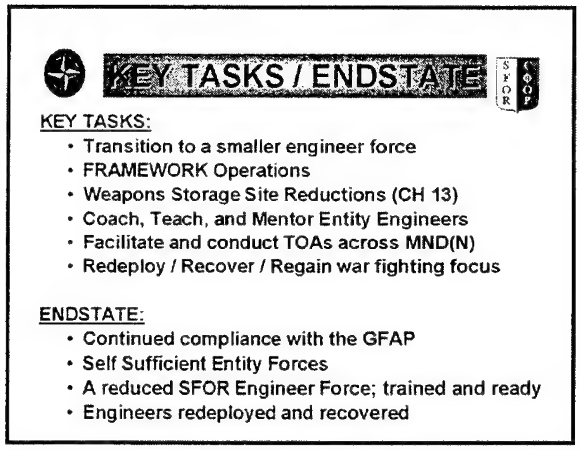


Figure 3. MND-N Engineer Mission

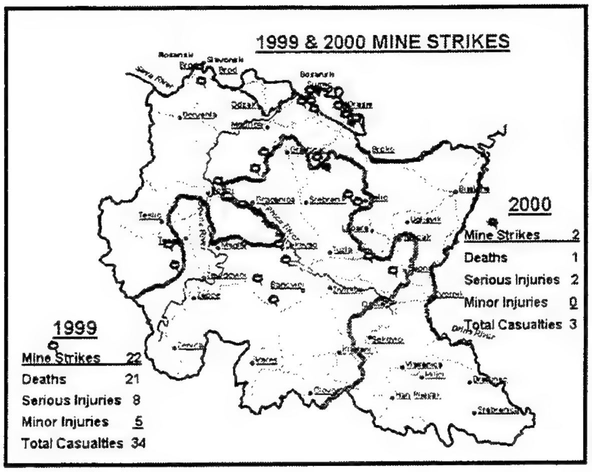
Figure 4. MND-N Engr Task / Endstate

MINES

Mines are a significant threat to military forces in most contingency operations. A "poor man's" weapon of choice, mines can maime or kill people and damage or destroy vehicles long after the conflict has ended. Given current technology deployed forces are not capable of having perfect knowledge of the location or characteristics of all the mines encountered during a contingency operation. Even if we knew what type of mines were used, factors such as age of the mine and variations in production quality and standards affect the sensitivity and characteristics of the mine to be removed. It is best to treat all suspected areas as mined until they are "proofed"[3] or cleared.

To safely and efficiently task and employ multinational engineers to perform dangerous demining operations, it is important to know their country specific engineer training level and areas of expertise. Different countries have different levels and focuses of training for their engineers.

For example, U.S. military forces train their combat engineer forces to deal with mines. As a base line, U.S. Army Combat Engineers are trained on emplacing and removing all types of mines and booby traps. The Russian Army has no EOD soldiers so their combat engineer soldiers receive basic EOD training, though not as proficient as U.S. EOD soldiers. British Engineer and EOD soldier functions are separate, much like the difference in training focus between U.S. engineers and EOD. The Turkish Army has EOD soldiers that perform their mine and UXO handling functions, while their engineers are construction focused only.



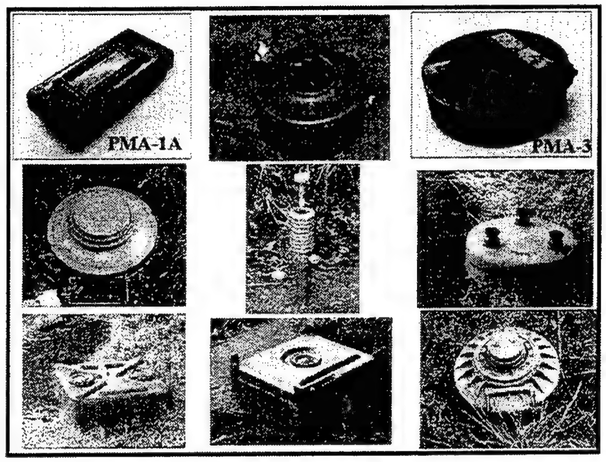


Figure 5. Minefield Overlay, SFOR 6

Figure 6. AT - AP Mines

Training programs for Host Nation Engineer Forces are designed and based on their level of engineer proficiency and capability. The EAF engineers in Bosnia, equipped as indicated in Figure 8, are trained by engineer or Special Forces soldiers in very basic mine sweeping operations and "blow in place" demolition skills. This training is frequently conducted in Academy's such as highlighted in Figure 7. Their participation in the demining program was mandated in the "Instructions to the Parties" (ITP) that supported the "General Framework for Peace Agreement" (GFAP) signed by representatives of the former warring factions. If they didn't conduct the prescribed demining operations, then entity armed force movement and training was banned. Even with this political and army level pressure, the actual EAF soldiers performing the demining had some reservations. They were concerned for the welfare of themselves and their family if a mine accident occurred as Figure 5 and 6 highlights. All levels of Entity, Coalition, and International Organizations had to reach an agreement as a result of extensive negotiations to enhance EAF demining personnel security. This agreement stipulated that the Entity Armies would pay their demining engineers their base pay, plus hazard pay, and the International Organization would pay for insurance, an initial issue of individual protective equipment, and provide an ambulance for each demining team. The Coalition units provided demining team training, quality control, and the proximity support of additional communications and air medical evacuation.

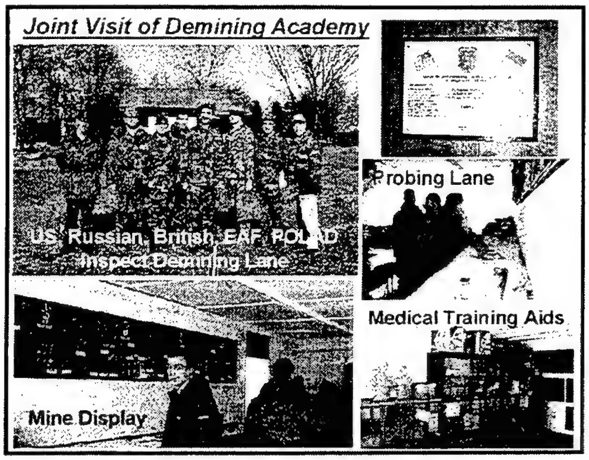


Figure 7. EAF Demining Academy

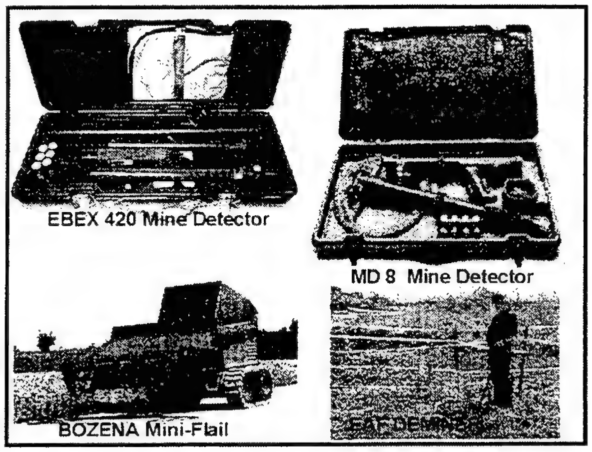


Figure 8. EAF Deminer

As an additional engineer challenge, the tri-party government of Bosnia-Herzegovina signed the Ottawa Treaty, agreeing to the destruction of all their antipersonnel landmines in accordance with the Ottawa Treaty stipulations. This commitment proved to be challenging and deadly, costing several entity and coalition injuries during the preparation and conduct of this large-scale demolition effort.

Overconfidence and assumptions on mine stability can also be deadly. An example is the unstable Yugoslavian M79 stake mine. Though designed after its Soviet counterpart, the Yugoslavian manufactured variant of the M79 has low tolerance and quality control levels, resulting in unstable characteristics. Specific handling procedures were developed by the U.S. EOD technicians and exported to all coalition and former warring faction leaders. Resistance to follow these procedures decreased after the accidents. Though it was at the cost of life, this circumstance improved future coordination between coalition and entity armed force engineers and EOD technicians.

There is no basis in current doctrine that outlines the procedures that an engineer commander and unit could follow to identify, coordinate, train, and execute these coalition and entity engineer demining and excess ordnance destruction missions. Missions such as the Anti Personnel (AP) mine destruction program illustrated in Figure 10 will routinely be developed without prior doctrinal example.

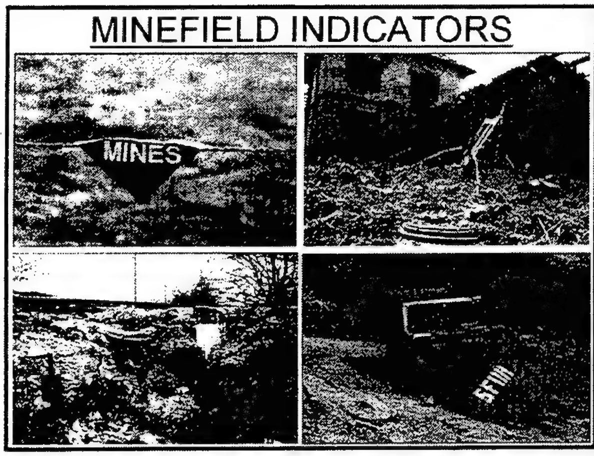
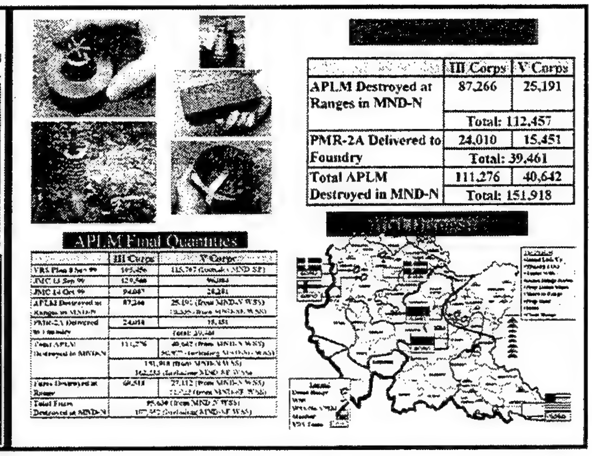


Figure 9. Minefield Indicators



	III Corps	V Corps
APLM Destroyed at Ranges in MND-N	87,266	25,191
	Total: 112,457	
PMR-2A Delivered to Foundry	24,010	15,451
	Total: 39,461	
Total APLM Destroyed in MND-N	111,276	40,642
	Total: 151,918	

Figure 10. AP Mines (Ottawa Treaty)

MECHANICAL DEMINING

The safest and fastest method for clearing a dirty battlefield is through the use of mechanical clearing assets. It is important when planning mine clearing operations to remember that mechanical demining equipment is only effective in level, open areas. Restrictive terrain around built up areas, uneven ground, and vegetation such as illustrated in Figure 9, requires manual demining techniques.

Part of the Task Force engineers risk assessment process is minimizing exposure of the combat engineers and Explosive Ordnance Detachment (EOD) personnel to the hazards of demining. Manual demining equipment has improved very little. Engineers still use metal detectors and mine probes to detect metallic and non-metallic mines and unexploded ordnance (UXO). Continued emphasis and increased funding is seriously required if engineers and scientists are going to successfully develop new demining technology and reduce the threat to our engineer soldiers performing the demining mission.

Figure 11. Mine Clearing Flails

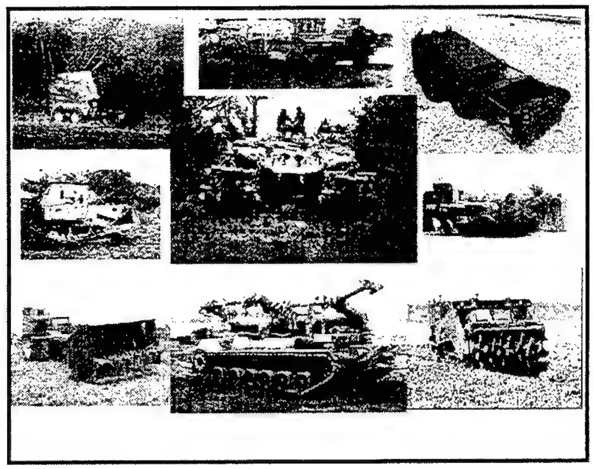


Figure 12. Mine Clearing Plows

When establishing and expanding base camps such as Multinational Division-North, Eagle Base, Bosnia, engineers must proof all areas prior to use by occupants of the base camp. The smallest mechanical clearing and proofing asset available to deployed engineers is the mini-flail (see Figure 11), a remote controlled, skid steer sized vehicle with rotating chains that beat the ground, applying concentrated point loads to detonate antipersonnel mines. The disadvantage of the mini-flail is its susceptibility to damage from anti-tank mine detonations. Tank mounted mine plows, rollers, tillers and armored dozers (see Figure 12) are best used for clearing large, open, level areas of anti-tank mines. Remote control systems are safer though less responsive than operator manned systems. Conversion of EAF combat tanks to mine clearing vehicles with plows and rollers is an excellent peace transition task, helping clear their country of mines and demonstrating a peaceful intent.

UNEXPLODED ORDNANCE

Unexploded Ordnance (UXO) is a significant challenge in complex contingency theaters. Frequently intermixed with mines, UXO is an inherently unstable, unpredictable, and an extensive hazard to military peacekeepers and civilians. Military EOD assets are indispensable, complementing the capabilities of combat engineers.

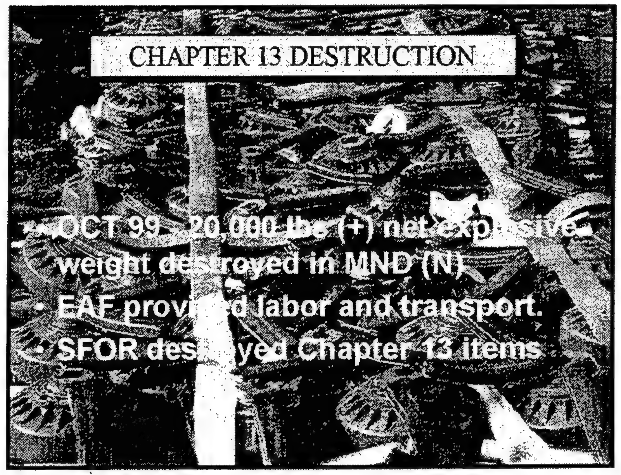


Figure 13. Operation Harvest Program

Figure 14. Large Scale Blast Opns

Organized programs, such as "Operation Harvest" in Bosnia (see Figure 13), are designed to facilitate the cooperation of multinational forces (maneuver, engineer, EOD, and military police), International Police Task Forces (IPTF), political leaders, civilian police, Civil Protection Forces (CPF), and Entity Armed Force Commanders. Successful execution of this program can reduce the hazard of excess or unserviceable ordnance and weapons that threaten the stability of maintaining a safe and secure environment.

UXO collection procedures are complicated, challenging, and dangerous. Frequently, the host nation populace will hand deliver mines, unexploded ordnance and weapons directly to our soldiers on patrol or at the entrances to our base camps. A dedicated training program is vital to educate our soldiers on the safest method for receiving and temporary storing the mines and UXO until EOD or engineers can properly dispose of it as illustrated in Figure 14. An information campaign should include mine and UXO identification posters and radio broadcasts to describe the different handling and turn in procedures for mines and unexploded ordnance versus ammunition and weapons. It is important to clarify the roles and responsibilities of the host nation civilians, civil protection forces, and Entity Armed Forces versus the peacekeeping coalition forces, in the collection, storage and ultimate destruction of these dangerous tools of war.

Civil Protection Forces (CPF) are host nation civilians trained to perform EOD and disaster relief operations as illustrated in Figure 15. In Bosnia their force size was small, funding from international organizations, such as the German Organization HELP, was sporadic, and training levels were inconsistent. A successful technique employed by the Chief Engineer of Multinational Division-North (MND-N) was to identify and increase the CPF capability, and start the transition from host nation dependence on MND military EOD support

to civilian led UXO response. This was accomplished by coordinating and conducting combined military – civilian EOD response missions. This exposure gives the task force EOD detachment the opportunity to access the CPF's capability, demolition skills, authorized access to and storage of demolitions, demolitions range availability and safety procedures, safety equipment availability and usage, response procedures, methods of contact (phone, office), responsiveness, and hours of operations.

For disaster response capability assessment and training, the task force engineers and military police typically take the lead. Acts of God, such as hurricanes, floods, and mudslides as shown in Figure 16, don't care if the war is over. U.S. response to these types of incidents falls more under disaster relief and nation assistance rather than peacekeeping; but, the residual mine, unexploded ordnance, and terrorist threat is still there.

Figure 15. Civil Protection Forces

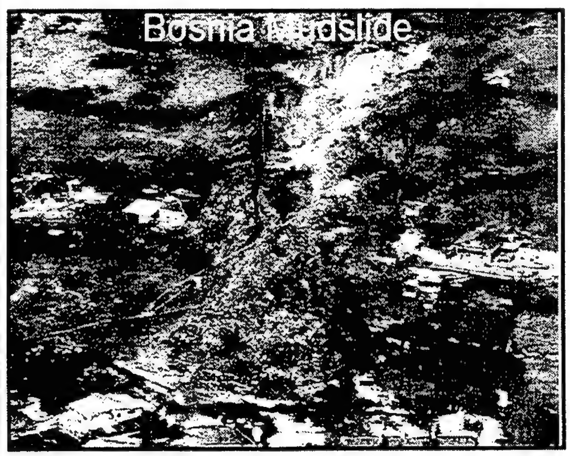


Figure 16. CPF Disaster Response

Availability of Joint EOD forces significantly increases the overall capability and flexibility of the contingency engineer force. Navy EOD possesses underwater ordnance clearing capability and sea mine identification and response expertise, plus all other basic EOD capabilities. During SFOR rotation 6, the Navy EOD cleared an underwater fording site for an MND-N mechanized force (see Figure 18), and identified, safety transported and destroyed numerous EAF sea mines found in a weapons storage site. They also bring a forced entry capability not usually available with Army EOD units. The different service EOD organizations possess variations on detailed information for dealing with different munitions. The U.S. military does not routinely work between services to combine this knowledge, but should do so.

Combined EOD training with other countries participating in the contingency operation is a valuable, capability-enhancing tool. For example, U.S. EOD forces identified that the British EOD possessed a directional thermite device (Fire Ant) that was very effective in neutralizing the dangerous M79 Stake Mine, which were otherwise blowing up, injuring SFOR and EAF

engineers and EOD, and causing collateral damage. Also many experience-based lessons learned are exchanged on the different munitions encountered including both successful and unsuccessful handling procedures. These operational lessons must be captured and passed on to future EOD and engineer practitioners.

Technology is the key to reducing the exposure of U.S. EOD and engineer forces to the hazards of mines and unexploded ordnance. Equipment like the Talon, Andros, and Lemming Robots shown in Figure 17, and ordnance XRAY machines are invaluable to safely determining the condition of an unexploded piece of ordnance or mine. Continued development and fielding of these systems to our EOD soldiers is critical to safe mission accomplishment in future contingency operations.

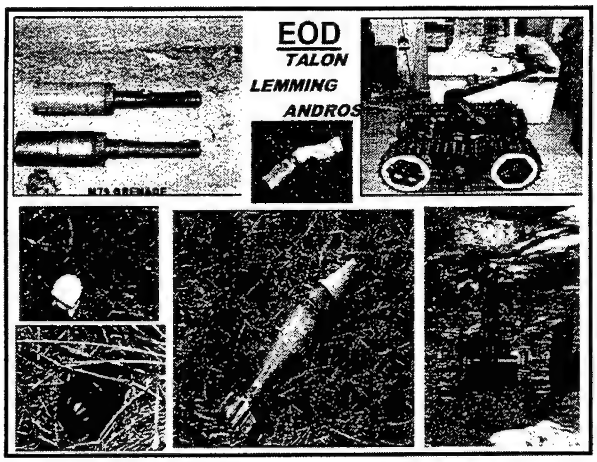


Figure 17. UXO Identification

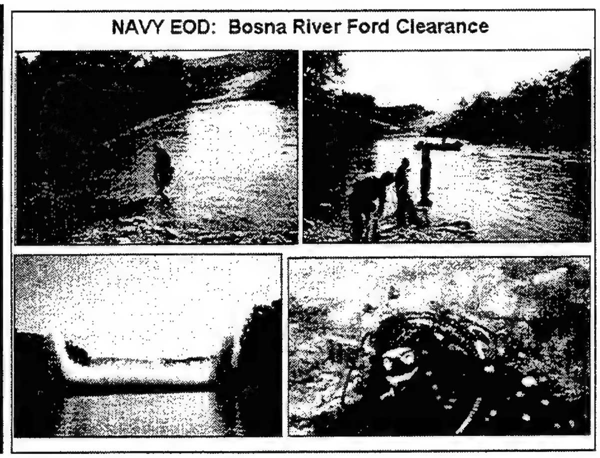


Figure 18. Navy EOD Ford Clearing

ROADS

In most countries where military forces are deployed to conduct peace operations, the infrastructure is minimal. This is usually due to limited economy and/or destruction during preceding conflict.

Figure 19 is an example of the magnitude of lines of communications identification within a contingency area and their criticality to the deployment and employment of a contingency force. Task Force engineers must identify the capability of designated routes to support the heaviest military vehicle that will use it. Route reconnaissance is a technical skill best performed by task force engineers, though Military Police, scouts, and other elements conducting patrols should routinely identify and report basic route status information. The more detailed the information, the more efficient the task force engineer can plan for subsequent reconnaissance and repair.

Figure 19. TF Routes, SFOR 6

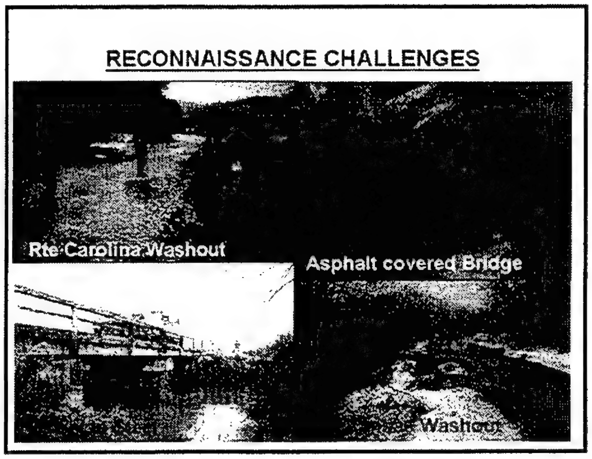


Figure 20. TF Routes, SFOR 6

The engineers of different national contingents in the coalition have their own methods of performing route reconnaissance (recon). Since many non-U.S. vehicle classifications are different and usually lighter, they frequently under classify the routes they recon. As part of the engineer estimate, task force engineers must determine the methods of classification used by other members of the coalition, and how to correlate them to U.S. route classification tables. Additionally, the construction materials used by the host nation in their permanent bridges may have different dimensions and qualities than those of the U.S. Engineer bridge classification tables require the engineer to round structural member dimensions down to the nearest table dimension. This actual rounding down can result in a significantly lower bridge classification than the actual structural capacity of the bridge. To get more accurate bridge classification, it is necessary to obtain host nation steel and timber standards manuals, and extract their dimension factors for use in U.S. engineer bridge classification formulas.

The "so what" of conducting route and bridge reconnaissance is the preparation and distribution of a "route status" update by the military police and task force engineers followed by the prioritization and execution of a route maintenance and repair program. Maintenance of task force routes is critical to their continued availability. Roads not maintained by the host nation for an extended period of time begin to deteriorate. The resulting lack of drainage causes water to saturate and erode the sub-grade frequently resulting in catastrophic pavement failure as demonstrated in Figure 20. When the failed road sections are in mountainous terrain, the slope failure repairs (uphill and downhill shoulders of the road) are extensive, and usually exceed troop labor capability. If the failing road section passes through a mined area, combat engineers must clear the mines first. This is a mission that is extremely time consuming and dangerous. Next the construction engineers conduct an assessment of the engineer effort required to bring the route back up to minimum military standards. Drainage

analysis and emplacement is the first critical construction task for a durable repair of the failed road sections. Next, as with any road construction project, an acceptable quality of base course material is required. Different countries have different rock and soil types available. Coordination with local host nation engineers is valuable for identifying suitable and available construction material types and sources.

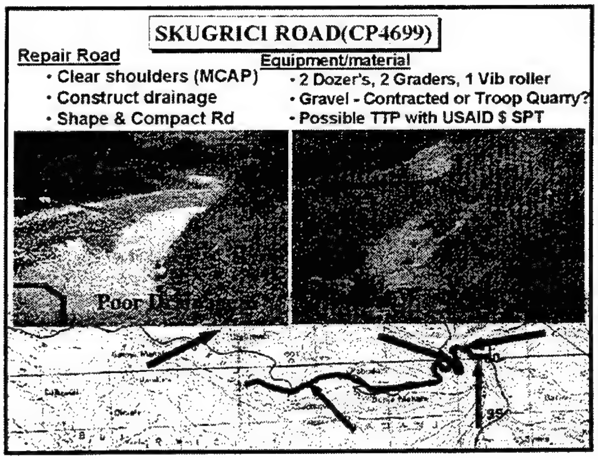


Figure 21. Road Failure Photo

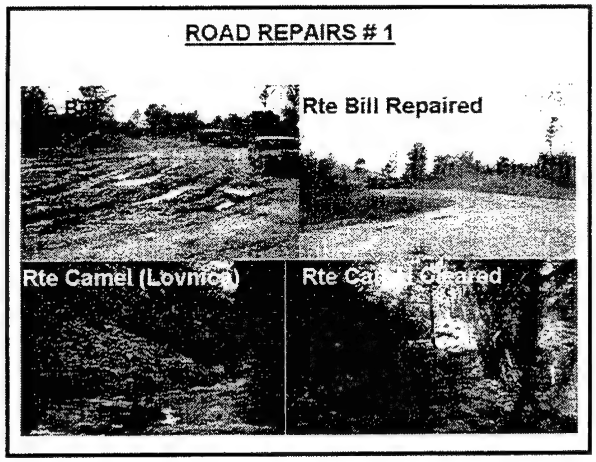


Figure 22. Road Failure Photo

Most task force routes are also critical routes for civilian freedom of movement. As the safe and secure environment prevails, displaced persons and refugees start to return home. As the economic development along the route increases, so does the amount of traffic. An example of this is the Arizona Market in Bosnia. This market was started by the NATO Task Force Engineers clearing the mines and unexploded ordnance from an area on each side of a key stretch of road outside of Brcko that was readily accessible by all three factions of Bosnia people. This resulted in free enterprise (though often corrupt) establishment of a small market of varying vendors selling critical food and other basic necessities to the populace. This was a critical first step in bring the warring factions back together under a common bond, basic survival. Still not the end of the engineers mission, this increased traffic causes the road to deteriorate more rapidly. It is important for the task force engineer to initiate coordination early with the host nation highway department and city engineers. The goal is for them to take over the responsibility for the road maintenance and repair, such as the roads in Figures 21 and 22, as their economy improves.

BRIDGES

U.S. Military Bailey Bridge, Medium Girder Bridge (MGB), and Float Bridging are primarily employed by U.S. forces to enhance mobility to U.S. and other coalition combat forces along key lines of communication. Figure 23 illustrates the magnitude of this bridging effort in SFOR

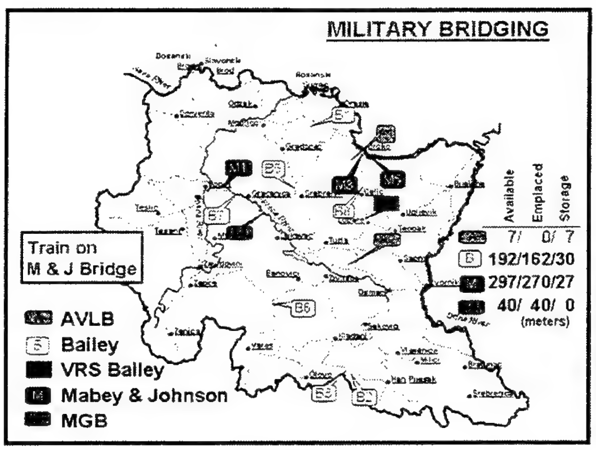
and is typical of operations in most contingency theaters. U.S. engineers usually execute the majority of the early bridging effort in order to support initial, rapid movement of U.S. forces into the theater. Subsequently, it is a coalition engineer effort to construct and maintain additional bridges. Emplacement of this bridging requires extensive site surveys, mine clearance, bank preparation, bridge construction, and periodic technical inspections. The life expectancy of military bridging is based on the vehicle impact load and pass frequency. Removal of the military bridging is determined by many variables, to include their importance to the continued mobility of the military force and the impact on civilian economy (example: Brcko's dependence on tax revenue from trucking imports across the bridge from Croatia to Bosnia). The repair or replacement of the permanent bridge requires the removal and relocation of the military bridge to allow access to the existing damaged bridge, or the more expensive construction of a new permanent bridge at a different location.

As this bridging effort increases, the availability of engineer forces to execute the mission begins to decrease. Toward the end of a contingency operation, when the area is assessed as "safe and secure", the force cap (limit on the number of personnel deployed into theater) usually drops. The first coalition asset the task force commanders cut is usually their engineers. If there is no U.S. mandate to transition to nation building or nation assistance, then the task force commander's primary focus is on continuing the safe and secure environment. Without adequate engineers, the task force has a significant challenge transitioning out of the contingency operation. A resourceful task force engineer will harness all the available coalition and host nation engineer capability to augment the minimal remaining U.S. engineer forces and accomplish the increasing, not decreasing engineer nation building effort. Appropriate joint doctrine must reference the level of engineer bridge construction and maintenance effort required to sustain coalition task force operations in a complex contingency environment, and recommend a more adequate level of engineer contingency force structure to accomplish this vital mission.

With limited engineer forces and bridging assets, the prioritization of bridge and road repair assets gains high visibility. Coalition military bridge assets can typically only be placed on task force routes to support coalition military freedom of movement. As task force commanders, state department representatives, and international organizations identify critical lines of communications necessary to support resettlement and economic development, the need for bridge repair and construction grows exponentially. There are numerous contributors of bridging assets. Some of the increased maintenance requirement comes from international organizations that contract for new bridges, departing coalition members who leave their

military bridging (or their country may ship and donate old stockages of bridging (such as the Swedish Bridge in Figure 24), and new host nation military bridging. Prioritization of these bridge assets has the highest visibility and effects coalition commander's engagement plans at all levels.

A successful technique used by SFOR engineers was to have the Civil Affairs Task Force conduct area assessments, coordinate with respective NGO's, and prioritize their need for bridging assets. This priority list included reviews for balancing the engineer effort provided to each of the former warring faction areas, so that there was no "perceived" favoritism. Often, bridging is an excellent tool for encouraging and facilitating host nation community self-sufficiency. For example, displaced persons/refugees were told that if they occupied and cleared the debris from their home sites, then a bridge would be constructed which would allow trucks with construction materials access to their homes.



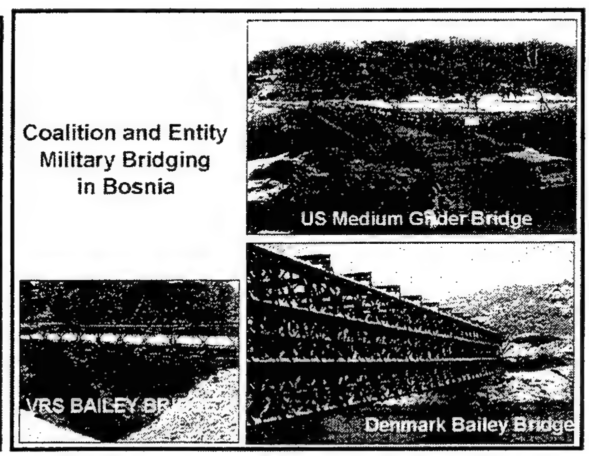


Figure 23. Military Bridge Map, SFOR. Figure 24. Military Bridging, SFOR

The Civil Affairs priority list was also used by task force engineers to prioritize critical reconnaissance priorities, demining priorities, and the subsequent design and allocation of bridge assets. The MND-N and SFOR commanders approved the final plan prior to donor bridge emplacement. Frequently, the temporary military bridging was the catalyst necessary for increased resettlement and economic activity, which was the gage frequently used by International Organizations to fund permanent bridge construction.

Coalition bridging such as the British Bailey and the Swedish MGB are often similar in appearance to U.S. bridging, but frequently have different dimensions. Some parts are interchangeable and some are not. It is important to inventory all available bridge parts, compatibility, and resulting gap crossing capability. Different country members of the coalition have varying rules on the usage of their military bridging and differ in their willingness to donate them permanently to the host country.

Host Nation bridging such as Serbian, Croatian, Bosniac military Bailey type bridging is of a smaller design than U.S. bridging. In Bosnia entity armed force engineers emplaced their bridging across short gaps to, replace smaller bridges destroyed during the war. Coalition Engineers must then inspect entity armed force bridging, just like all other bridges, prior to it's supporting coalition traffic. It is important to insure that the entity engineers emplace all of their bridging, before committing Task Force bridging assets. Again, the focus is on helping them to help themselves.

The EAF engineers in Bosnia had varying levels of combat engineer and construction engineer experience. Serbian Engineers have extensive mine and float bridge experience as identified in Figure 26, while the Croat engineers have horizontal construction capability, and the Bosniac engineers have extensive horizontal and vertical construction capability as demonstrated by the bridge construction photos in Figure 25. Realizing indigenous capability, an excellent technique for establishing and maintaining engagement with both coalition and host nation armed forces is to coordinate combined engineer projects such as road and bridge maintenance and repair projects.

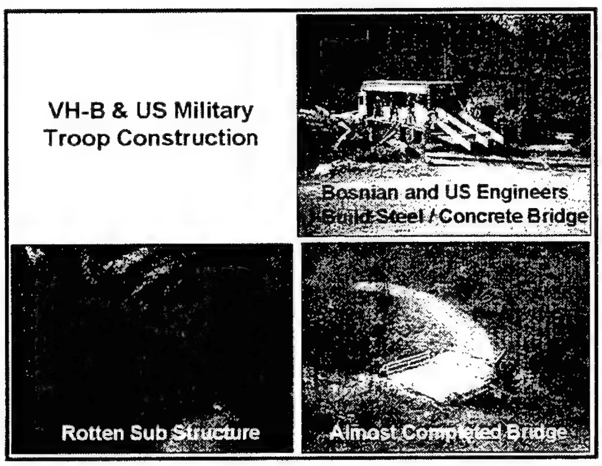


Figure 25. Bosnian Military Bridge

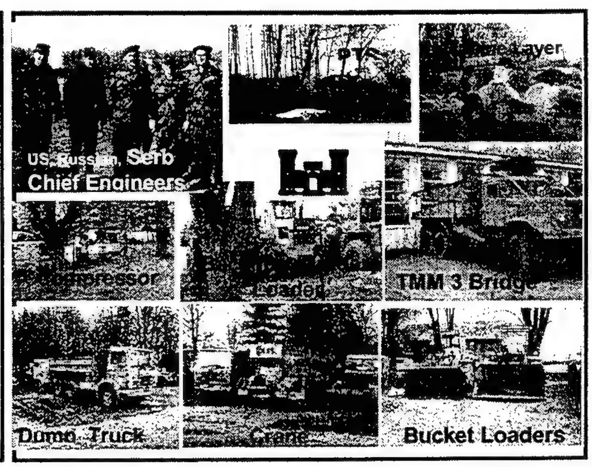


Figure 26. Serb Engineer Visit

TROOP AND CONTRACT CONSTRUCTION

Construction of large magnitude can quickly exceed the capabilities of many combat engineer leaders. Unless they have an engineer degree or extensive construction experience, engineer leaders frequently require outreach or augmentation support from Corps of Engineer districts, battle labs, or contractors.

Troop Construction

The senior leadership of our Army are led to believe that contractors can perform all of the construction support required on a deployment, thus questioning the need for construction engineer units. There is no doubt that contractors can provide an invaluable support to deployed units. However, it takes a minimum of 30 to 60 days for a contractor to mobilize in a contingency environment. Two key caveats on contractor support that must be remembered are:

First, the contractor is dependent on the ability of the infrastructure to support him with labor, construction material, and logistics support facilities. The contractor may even compete with deploying military forces for port throughput if most of his resources come from outside the contingency area. Contractors will not be available to support the military until they have recruited suitable labor force, built their own base camps, and acquired adequate quantities of construction equipment and material to meet contractual obligations.

Second, many of the required construction projects, if contracted, exceed the Title 10 U.S. Code funding limits. The task force commander has the option to develop a formal project and submit to Congress for approval, a very time consuming process; or, use engineer troop construction labor and charge only the material costs of the project against the funding limit.

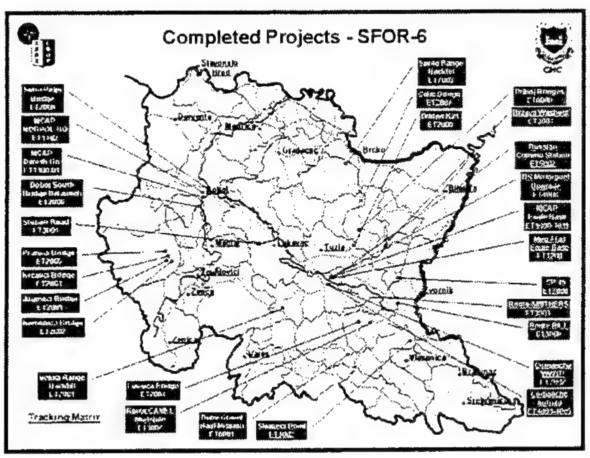


Figure 27. Construction Projects, SFOR 6

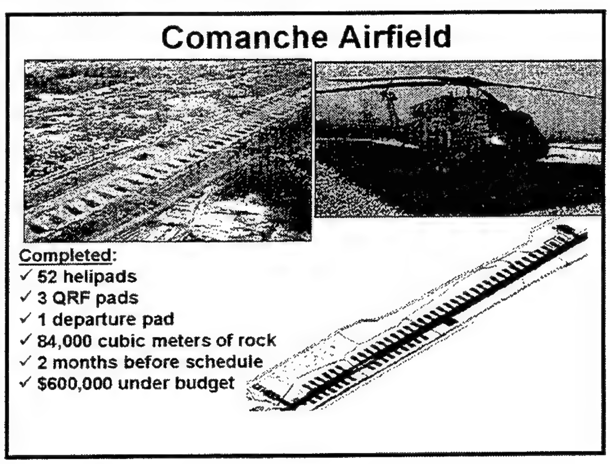


Figure 28. Army Airfield Construction

Base Camp Coordinating Agency

A recently identified, temporary engineer organization is the Base Camp Coordinating Agency (BCCA). The existing engineer brigade or battalion staff does not typically possess the manpower or experience to perform this base camp public works type function. The BCCA is established during a contingency operation to augment the Division Engineer's construction management capability. The BCCA Chief is typically an engineer field grade officer, preferably with contract construction management experience. Staffed with a combination of military and civilian Corps of Engineer employees, the BCCA serves as the single point of contact for base

camp planning, construction, operations and maintenance, and base camp closure in support of a deployed contingency force. The BCCA is capable of administering the work order process by evaluating the scope, budget impact, and support requirements to economically execute approved projects; provide Real Estate support; train Base Camp Commanders and Mayors; manage the Base Camp Assessment Team (BCAT); and administer the Joint Acquisition Review Board (JARB).

Real estate surveys conducted prior to occupation by military forces significantly reduces litigation after the operation, and expedites force redeployment. Terrain management is critical prior to units occupying their base camps. This effort will directly reduce or prevent multiple unit moves.

A recurring challenge for the engineer is the conflict of authority to construct temporary versus permanent structures in support of the contingency operation. Often the material type is what delineates the category of the construction. Different countries have different materials available at different prices. If concrete block is less expensive than wood in a particular theater, then, choose the appropriate material based on construction time, material availability, and resulting lower cost. Commanders should not let outdated Title 10 restrictions force the wrong choice. Instead they should justify and get an exception from the Engineer Title 10 approval authority and document the decision process.

Contract Construction

As the decision is made by the National Command Authority (NCA) to keep U.S. forces deployed in support of a particular contingency, there is usually a transition from tents to fixed facilities. The Logistics Capabilities (LOGCAP) contract is an option available to the deployed contingency force to augment available troop construction effort with civilian contract construction capability. Mobilization time and resources required for a civilian organization to stand up varies with the location and availability of host nation labor and construction material, equipment, and commercial support facilities. There are numerous benefits for using contract construction including freeing up engineer troop labor to conduct combat engineer missions, experienced civilian construction force, and stimulation of the host nation economy through hiring local labor and purchasing their goods and support services. Disadvantages of contract construction include much higher cost versus the use of troop labor, security issues of local labor forces on military base camps, larger base camp footprint to accommodate additional civilian work force, and less flexibility of civilian workers.

Previous to the Balkans mission, the U.S. Army Corps of Engineers managed contract construction. In the Balkans, this responsibility was transferred to the logisticians under the guise of a "service contract". Though this service contract is very convenient, Defense Contracting Management personnel are trained and manned to monitor services contracts, not construction contracts, leaving the construction contractor unmonitored. An example of this was the construction in Bosnia during SFOR 6, which always "exceeded" the quality required and led to appropriately increased costs. The best solution to insure that taxpayer money is well spent and the ground commander's needs are adequately met is to place all contract construction directly under the supervision of the Corps of Engineers.

Environmental

U.S. forces are required to follow the same environmental considerations when deployed as when they are back home. Many countries do not have adequate or operational sanitation facilities. Even if the host nation dumps their raw sewage directly into the local rivers, we cannot. A frequently encountered issue is whether we can hire a contractor to dispose of our sewage, knowing that they are in turn hauling it to an inadequate (in accordance with U.S. environmental standards) treatment facility or other dumpsite. Determination by the U.S. Congress and National Command Authority of the duration of the stay of U.S. military forces, directly impacts on the type and level of environmental treatment facilities the BCCA can fund and contract. A cost benefit analysis of the expense for the contingency force to contract the removal and disposal of waste versus the cost of constructing and operating a waste water treatment plant. The longer U.S. forces are projected to be deployed, the more feasible is the construction of the wastewater treatment facility. An engineer lesson learned in Bosnia is not to assume that the right bacteria (bugs) are available, in country, to start up the waste breakdown process in the new treatment tanks. Since there was no operational wastewater treatment plant in Bosnia, there were no "waste bugs," so the BCCA had to locate and coordinate for their shipment from an out of country source.

Deployed units have trained teams equipped with spill response kits, and the engineer unit should have engineer equipment designated to respond to large spills. As in Bosnia, the task force engineer's BCCA can coordinate a civilian contract capable of responding to hazardous material spills, such as those frequently encountered when improving facilities constructed on existing host nation infrastructure with abandoned underground utility lines and storage tanks.

Funding

Funding for contingency operations is provided by Congress through the Major Command (MACOM) responsible for the contingency. It is important to determine the specific money controlling procedures within the contingency area. For example, the USAREUR DCSENG managed Title 10 authority for SFOR and KFOR facilities construction and maintenance. Title 10 funds have specific restrictions as highlighted in Figure 29. Funding limits of $500k for new construction ($1M if it is a safety issue); and, $2M for maintenance and repair are non-negotiable for the expenditure of Operations and Maintenance Army (OMA) funds. Commanders cannot change these rules; but, there are smart ways for the engineer to develop contract and troop construction projects to insure that the commander's intent is best met and the funding laws are followed.

TITLE X

- **HCA activities must:**
  - Promote U. S. foreign policy.
  - Promote soldiers operational readiness skills.
  - Promote security interests of the host nation and U. S.
  - Complement, but not duplicate, other U. S. economic aid.
  - Serve basic economic & social needs of the target populace.
- **Types of HCA Projects (de minimis is only program):**
  - Medical, dental, & veterinary care.
  - Construction of rudimentary surface transportation systems.
  - Well-drilling & construction of basic sanitation facilities.
  - Rudimentary construction & repair of public facilities.
- **No statutory dollar amount, but Division Commander authorized $2500.**

Figure 29. Title 10 Funding Slide, SFOR 6

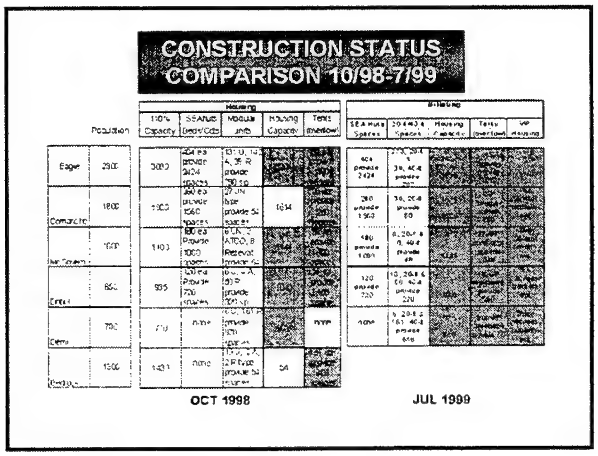


Figure 30. Base Camp Status

Joint, coalition, and combined engineer operations are the way of the future. Title 10 funds are very restrictive. NATO funding is bureaucratic, and host nation funds are typically non-existent. Frequently, it costs more "not" to pay for a particular coalition expense, and then deal with and pay for the resulting time and material delays in integrating and synchronizing the coalition. As quoted earlier in this paper, "For the want of a truck load of gravel, we could bring peace to the world." The sooner peace is achieved, the sooner the task force can go home. Freedom of the task force commander to commit contingency operation funds in a manner which best accomplishes the overall mission, is key to the success of the contingency operation. More formal interaction between US agencies such as US Agency for International Development (USAID) is another key to the efficient use of "all" US monies spent in the country, while furthering economic, diplomatic and military progress.

SURVIVABILITY AND FORCE PROTECTION

Task Force Commanders must balance the cost of force protection assets versus an increased military manpower guard requirement. Joint Security Inspection and Vulnerability Assessments (JSIVA) give the commander a thorough review of the adequacy or inadequacy of existing force protection facilities. Terrain restrictions, coupled with funding and resource availability, require the commander to quantify his desired level survivability. What is the true threat? How many bunkers per soldier? What is the number and location of perimeter towers, lights, rows of chain link or triple strand concertina, and sensors such as those displayed in Figures 31 and 32.

Freedom of movement for patrols is critical to the military's success of maintaining a safe and secure environment. Movement around a complex mined contingency area is extremely hazardous to task force soldiers. Unless the vehicles are armored or hardened to resist mine blasts, survival to the occupants is unlikely. Battle labs need to continue to develop a fleet of armored vehicles and fully field them to units deploying to mined contingency areas of operation.

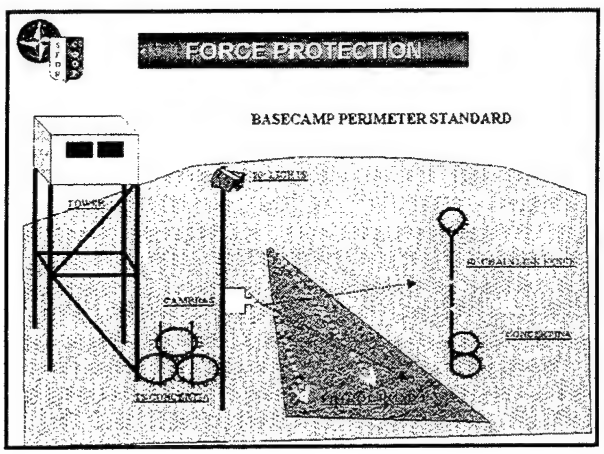


Figure 31. Force Protection Concept Slide

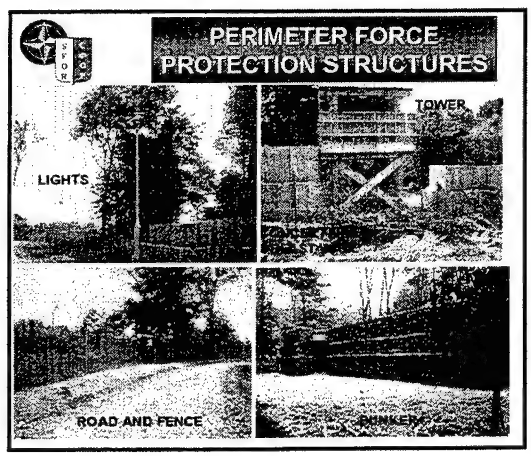


Figure 32. Force Protection Facilities

INTEROPERABILITY IN A MULTINATIONAL ENVIRONMENT

As frequently referred to in the preceeding comments, cooperation between U.S. forces and the other coalition forces are critical to successful execution of the voluminous engineer mission. There are not enough U.S. engineers to perform all the missions that the task force commander requires and desires to reach his end state in a complex contingency environment. In a recent Military Review article, COL Larry Forster noted that the application of cross cultural leadership imperatives is key to successful coalition operations.[4] Engineer leaders require different skill sets to maximize their relationship with engineers from other military forces.

There are extensive ways for the engineer leader to engage his coalition and host nation counterparts. The numerous military and non-military actors required to successfully execute a construction mission each requires a different coordination technique. Appearance of impartiality to all relevant parties helps to keep animosity down and increase the potential for further engagement and participation. Continued engagement frequently results in cooperation between all belligerents, sharing of available resources, confidence to encourage international organizations to contribute additional funds and materials, and overall progress towards infrastructure recovery and economic growth.

Professionalization

The professionalization of coalition and former warring faction forces is an important process that helps enhance peace. Complex contingency operations help set the groundwork for participating countries' engineers to join together in a common goal. This common destination is a valuable start point for increased cooperation and participation. Engineers lead the way in professionalization of coalition and former warring faction because they all have something in common, "they are already professionals by extensive education in their engineer fields." Though construction techniques frequently differ, the science of soils and materials is the same.

The first "turn off" to a successful professionalization program is to treat the other members of the coalition as though they are inferior to the U.S. forces. Joint reconnaissance of roads, bridges, construction material sources, and engineer equipment allows the coalition and EAF engineers to share their expertise as equals. U.S. engineers benefit from regional engineer information to more effectively perform their missions, anyway. This professional, non-threatening exchange of ideas and construction knowledge helps to propagate trust, cooperation, and a feeling of importance for the coalition members. As trust develops, so does the level of information sharing and true problem identification and solving efforts by all.

Coalition Engineer Operations

It is important to remember that most members of a coalition task force are not in their own country, and that they are there to help the host nation regain self-sufficiency. U.S.- only initiatives usually don't last beyond our presence in the country, while host nation led activities can continue beyond our deployment. An example of this is the repair of a deteriorated task force route by U.S. engineers only. If this route is critical to the mobility of U.S. forces, it is probably important to the freedom of movement of the host nation people that live and work

along this route (the whole reason U.S. patrols need the route). Though this repair may provide short-term mobility to the contingency forces, who will maintain the route once U.S. forces redeploy? If former warring factions participate in the repair of the route, then they get the chance and often support from the international community to repair and fuel their construction equipment, train their engineer soldiers, and demonstrate that the former warring factions have put down their weapons and are working together to repair their infrastructure. This engineer effort is often the catalyst to the civilians of a safe and secure environment, which will allow them to reinvest in their homes, businesses and community. This subsequent civilian effort gets the attention of the international organizations frequently looking for communities that are trying to help themselves. These are the communities to which International Organizations like to provide donor money.

Many of the interoperability and coalition building lessons are learned through the school of hard knocks. Often they are learned at the expense of a missed opportunity to further the progress of the peace operation. Inclusion of these lessons in appropriate professional military education centers and publications and as part of appropriate doctrine can help deployed U.S. service members to make a better initial impression and to be more effective.

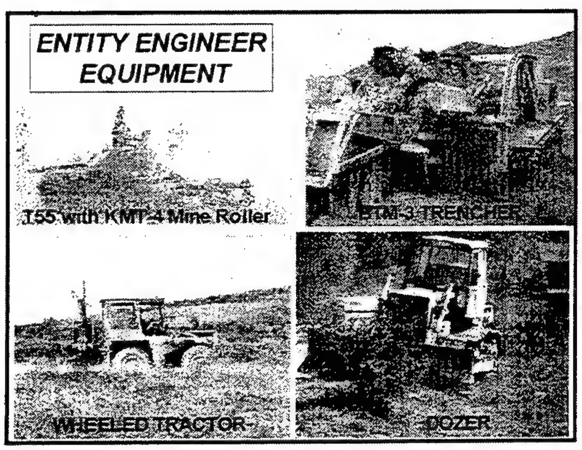


Figure 33. EAF Engineer Equipment

JOINT / COMBINED TRAINING

U.S. and ....

❑ RUSSIANS	-	BRIDGING / ROAD REPAIR
	-	DEMINING/ DEMOLITIONS
	-	AIRFIELD CONSTRUCTION
	-	FACILITIES CONSTRUCTION
❑ ROMANIANS	-	BRIDGING
	-	SNOW AND ICE CLEARING
	-	AIRFIELD CONSTRUCTION
	-	FACILITIES CONSTRUCTION
❑ HUNGARIANS	-	BRIDGING
❑ NORDPOL	-	DEMINING/BRIDGING
❑ CANADIAN EU	-	BRIDGE/ROAD DESIGN & INSPECTION
❑ REGIONAL EO	-	ROAD & BRIDGE INSPECT & REPAIR
❑ AUSTRIANS	-	CONSTRUCTION PROJECTS
	-	FORCE PROTECTION
❑ SEABEES	-	CONSTRUCTION PROJECTS
❑ NAVY EOD	-	UXO/CAPTURED MUNITIONS
❑ USAFE CE	-	UAV / AIRBASE CONSTRUCTION

Figure 34. Joint – Combined Operations

ENGINEER COMMAND AND CONTROL

The Senior Task Force Engineer is responsible for "all" engineer operations in the TF sector. Figures 35 and 36 help to visualize the complexity and variety of engineer elements that the Task Force Engineer must synchronize. The TF Commander does not and should not deal with multiple engineer commanders or staffs on engineer issues. The centralized approach to engineer command and control should be embedded in doctrine so that the Senior

Task Force Engineer provides continuity and efficiency of effort and resources between troop and contract engineer missions.

To assist the task force engineers, translators or interpreters with engineer experience or tenure are invaluable to effective communications with coalition and host nation engineers. In addition, Engineer liaison officers are critical to the effective planning of commanders and staffs at all levels. Early engineer planners provide realistic mobility, counter mobility, survivability and general engineering planning factors and available engineer support. Task Force planners, Civil Affairs teams, and civilian NGO /PVO will typically over commit or illegally commit military engineers if not influenced by engineer professionals.

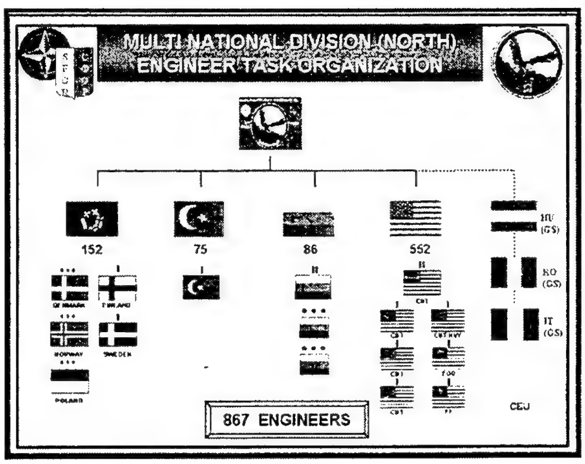


Figure 35. Engineer Task Org, SFOR

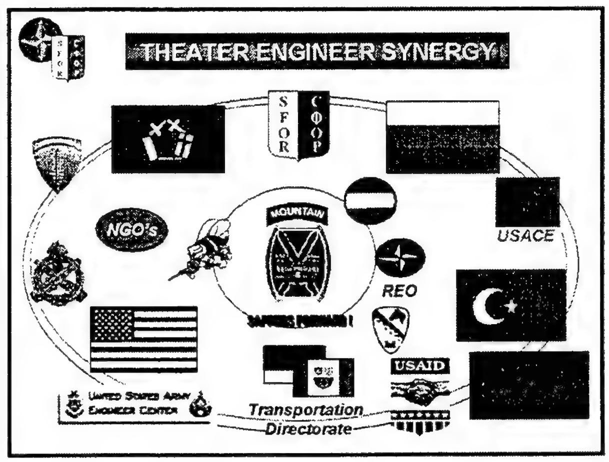


Figure 36. Engineer Synergy Slide

Command and support relationships for engineers in complex contingency operations may differ significantly from the habitual "attached" relationship that brigade and battalion task forces practice at home station or during training center rotations. Under the frequent-force caps, effective use of a shortage of engineer forces requires centralized management, with missions prioritized at the highest task force commander level.

CONCLUSION

Success during complex contingency operations is hinged on the performance of professional, skilled, trained, educated, and disciplined soldiers. To identify mission success in peace operations, you must link strategic aims with operational and tactical level action. The NCA defines the "end state" as what they want the situation to be when operations conclude (for both military operations, as well as those where the military is in support of other instruments of national power).

Joint, combined, multinational staffs and forces working hand in hand with interagency organizations are the future. The final termination of the peace operations may include the transition to civil authority, marking and clearing minefields, closing financial obligations, pre-deployment activities, and finally redeploying forces. The formulation of doctrine to guide engineer operations under these circumstances is extremely important and yet to be fully done.

Funding for engineer operations in support of complex contingency operations is a continual struggle. Engineer mission planning and execution is leader intensive and risk of failure is high enough without having to deal with the bureaucracy of cold war, congressional funding constraints. Joint/coalition/combined engineer operations are the way of the future. Frequently, it costs more "not" to pay for a particular coalition expense, and deal with the resulting delays in integrating and synchronizing the coalition. In addition, false savings result in an extension of the presence of the entire task force while waiting for the proper conditions of mission success. The freedom of the task force commander to commit contingency operation funds in a manner which best accomplishes the overall mission is key to the success of the contingency operation.

The task force commander's priorities for engineer missions are always among his highest concerns. They are always tied to providing freedom of movement for peace forces, force protection construction, or quality of life projects that effect troop effectiveness. It requires extensive engineer effort to accomplish these tasks. Without adequate, trained engineer support, the transition from peace enforcement and peacekeeping operations to one of nation building can be unduey extended. The desired transition, when it comes, is usually the trigger for allowing contingency forces to declare success and begin redeployment. Without extensive engineer support, a contingency force may never attain its end state.

RECOMMENDATION

It is critical to update joint and operational doctrine to acknowledge the tasks and priority of engineer effort required to conduct future complex contingency operations. Joint Task Force commanders must integrate engineer planners into the operational planning staff, not just the logistics planning staffs as is often the current practice.

Engineer leaders should update engineer doctrine to identify specific requirements for planning and synchronizing engineer operations with joint, combined, DOD, state department, host nation, and multinational organizations in support of complex contingency operations. Instructors at military education facilities should integrate this doctrine, and the opportunity to develop the requisite critical leadership skills into professional military education programs as appropriate at each level.

Military senior leaders should continue to fund and push for the development of improved technology for demining and unexploded ordnance detection and destruction. The EOD community must come together, to develop the most complete and accurate "blue book" of ordnance possible. With U.S. lives are at stake, a complex contingency environment is no place for inter-service rivalries to restrict reach back support.

The Army and SECDEF should submit a recommendation to Congress to change public law to gain efficiencies and flexibility in the commitment of funds. This requires making modifications to the existing Title 10 procedures. These modifications need to give the task force commander increased authority to support members of the coalition and host nation as necessary to further the success of the contingency operation.

With these recommendations being addressed, the effectiveness and impact of engineer operations can be greatly enhanced. Given the importance of engineers, any improvements in engineer capability result in more rapid mission accomplishment in complex contingency environments.

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ENDNOTES

[1] I used the term Complex Contingency Operation due to the varying number of terms and definitions used by Joint, United Nations, different military services, and civilian organizations. A few such terms are Peace Keeping Operations, Peace Enforcement Operations, Stability Operations, Support Operations, Low Intensity Conflict, and Operations Other Than War. To address engineer activities in support of U.S. Armed Forces conduct of Complex Contingency Operations it is important to define Complex Contingency Operations. A complex emergency is a humanitarian crisis in a country or region where there is a total or considerable breakdown of authority resulting from internal and or external conflicts and which requires an international response that goes beyond the mandate or capacity of any single agency.

[2] Gabriel Marcella, Dept of National Security and Strategy, USAWC, Carlisle, PA, Course 2, Vol. II, War, National Policy & Strategy", "NATIONAL SECURITY AND THE INTERAGENCY PROCESS", pg 304-322.

[3] The term "proof" refers to the engineer mission of thoroughly searching an area by manual means such as a metal detector or mine probe, or by mechanical demining equipment such as flails, plows or rollers. This insures that there are not mines or unexploded ordnance hazards in the area.

[4] Colonel Larry M. Forster, US Army, "Coalition Leadership Imperatives," MILITARY REVIEW, November-December 2000, pg 55-60.

BIBLIOGRAPHY

Allard, Kenneth. Somalia Operations: Lessons Learned, National Defense University Press, 1995.

Brooks, James E., "Engineer Coordination Slide. SFOR 6 Engineer Engagement Brief to SACEUR, Eagle Base, Tuzla, Bosnia, November 1999.

"Contingency & Disaster Engineering." The Military Engineer 92 (May-June 2000).

Coffey, Daniel. "U.S. Army Divers in Operations Other Than War." Engineer (August 1999): 9-10.

Eckstein, Jeff. "Operation Fuerte Apoyo: Disaster Relief in Nicaragua." Engineer (November 1999): 15-18.

Joint Doctrine for Civil Engineering Support. Joint Publication 4-04.

"Operation Joint Engineer." SFOR 6 Engineer Command Briefing Slides, Eagle Base, Tuzla, Bosnia, March 2000.

"Operation Joint Forge." After Action Report, Headquarters USAREUR, 7 June 2000.

"Peace Operation." USJFCOM Joint Warfighting Center Doctrine Division Newsletter 7, no. 2 (October 1999).

"Stability and Support Operations." Military Review, (September-October 1996).

U.S. Army Combined Arms Command. Center for Army Lessons Learned. Operations Other than War: Volume IV: Peace Operations. CALL Newsletter no. 93-8. Fort Leavenworth: December 1993.

U.S. Army Combined Arms Command. Center for Army Lessons Learned. Tactics, Techniques and Procedures for SASO. CALL Newsletter no. 98-11. Fort Leavenworth: April 1998.

U.S. Department of the Army. Engineer Operations Short of War. Field Manual 5-114. Washington, D.C.: U.S. Department of the Army, 13 July 1992.

U.S. Department of the Army. Military Operations in Low Intensity Conflict. Field Manual 100-20. Washington, D.C.: U.S. Department of the Army, 5 December 1990.

U.S. Department of the Army. Office, Chief of Engineers. Historical Vignettes. Washington, D.C.: U.S. Department of the Army, 1979.

U.S. Department of the Army. Peace Operations. Field Manual 100-23. Washington, D.C.: U.S. Department of the Army, 30 December 1994.